Nexus Summary

For The

Shell Pipe Line Corporation

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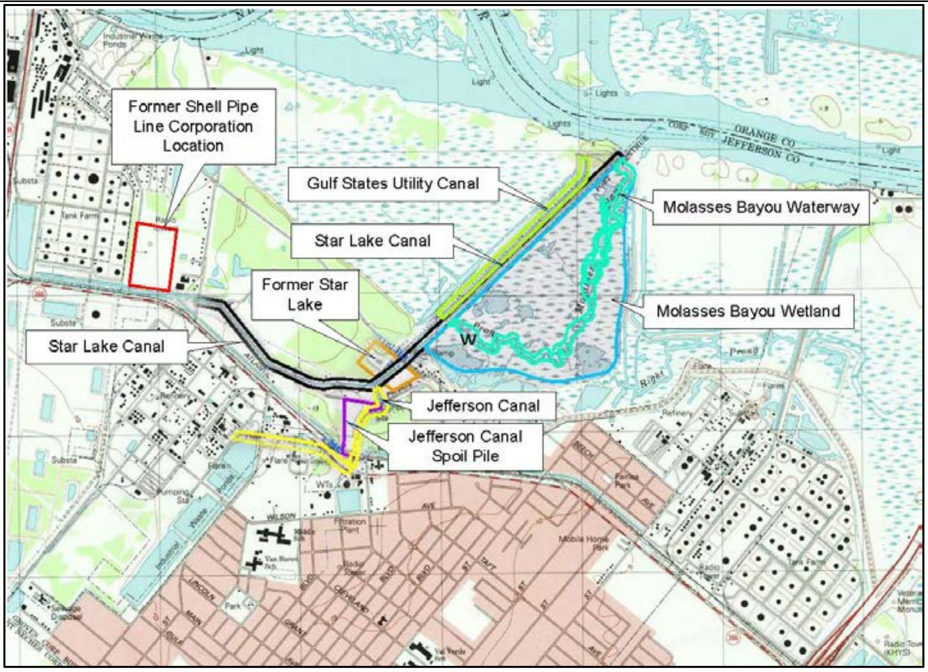
Part 1 – Site Summary Overview - Shell Pipe Line Corporation ("Shell")	
Location	680 Pine Street, Port Neches, Texas
Operational Period	1942 to circa 1984 – 1989
	 Figure 1. The topographic map depicts the approximate location of the former Shell site in relation to the seven highlighted areas of investigation ("AOIs") in the Star Lake Canal Superfund Site.[1] Source: USGS, 1993

[1] The seven AOIs, as depicted in Figure 1, include Jefferson Canal, Jefferson Canal Spoil Pile, Former Star Lake, Star Lake Canal, Gulf States Utility Canal, Molasses Bayou Waterway, and Molasses Bayou Wetland (Conestoga-Rovers & Associates and Cardno ENTRIX, *Final Tier 2 Remedial Investigation Report*, August 2011, pp. 12–14; United States Environmental Protection Agency, Region 6, "Record of Decision, Star Lake Canal Superfund Site, TX0001414341", September 2013, pp. 1–3. (Hereinafter, USEPA, 2013 ROD)

Part 2 – Operations Summary

On September 14, 1942, Shell acquired 40 acres of land in Port Neches.[2] [See Figure 2] On June 15, 1943, Shell sold 2.94 acres of the 40-acre tract to the Defense Plant Corporation ("DPC"). [See Figure 3] The DPC used the acquired land for a canal to discharge wastewater from several manufacturing plants owned by the DPC. According to the deed, Shell reserved the right to drain its property into the canal, as necessary. The deed further stated that the DPC was to provide Shell with any excavated soil from the canal not used in erecting levees. As a part of the conveyance, Shell covenanted that it would use this soil to grade its property so that the land would drain from north to south towards the canal.[3]

Shell built several bermed large aboveground storage tanks ("ASTs") on its property by December 1945.[4] [See Figure 3] A 1956 aerial of the Shell facility shows nine bermed ASTs. [See Figure 4] Sometime between 1984 and 1989, the tanks were removed from the site.[5]

Part 3 – Nexus Summary

Proper and reasonable maintenance of petroleum storage tanks requires cleaning of the tanks when the tanks need repair and when the contents of the tanks are changed, for example, when a tank storing crude oil is repurposed for the storage of a refined product. According to the American Petroleum Institute's (API") 1931 *Manual on Cleaning Petroleum Storage Tanks*, tank cleaning involved pumping or draining the oil and running water into the tank at or below the surface to allow the lighter bottoms to float to a suction drain. The piping connected to the tanks was blanked off so that external vapors could not enter the tank. The tank was then heated with steam and ventilated. Once the tank was safe for entry, workers used low pressure streams of water to break up sediment and sludge, which they then flushed out of the tanks. According to the API manual, sump pits were sometimes dug near tank openings and the sediments from tank cleanings were pumped to the pits.[6]

As described in a 1953 textbook on industrial wastes, "[t]ank bottom sludges vary greatly in their characteristics, e.g., from an easily pumpable fluid to a set solid."[7] A 1953 API study

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[2] Deed from O.W. and Clara Keith to Shell Pipe Line Corporation, September 14, 1942, Instrument 643872, v. 518, p. 114.

[3] Deed from Shell Pipe Line Corporation to Defense Plant Corporation, June 15, 1943; Letter to W. I. Phillips, Defense Plant Corporation, July 28, 1943.

[4] Map of Neches Butane Products Co., December 12, 1945.

[5] Map (circa) 1984; Aerial, February 22, 1989.

[6] API, *Manual on Cleaning Petroleum Storage Tanks*, August 1931, pp. 4-10. See also, API, Disposal of Wastes at Service Stations and Bulk Plants, 1933, pp. 4-5.

[7] Roy F. Weston, "Waste Disposal Problems of the Petroleum Industry," published in Willem Rudolfs, editor, *Industrial Wastes: Their Disposal and Treatment,* Reinhold Publishing Corp., New York, 1953, p. 445.

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found that tank bottom sludges contained, on average 39.4% water, 47.9% oil, 4.4% volatile solids and 8.3% Ash. [8]

Flushing tanks with water continued to be a common practice into the 1950s, notwithstanding that fact that "in some cases water flushing will create emulsions and suspensions that will produce unsatisfactory wastewater effluents."[9]

By the mid- to late-1950s, new tank-cleaning methods were introduced and, in some cases, solvents were used to reach parts of the tanks which were not accessible by other means. Solvents used included alkaline materials, acids, petroleum-based solvent, chlorinated solvents, and various emulsions. Typically the solvents were sprayed onto tank walls.[10]

Contaminated discharges from this facility to the Star Lake Canal likely contributed to contamination present in the Star Lake Canal AOI. The Star Lake Canal AOI includes the entire length of the canal from Orchard Road to its confluence with the Neches River. Star Lake Canal represents a continuous open water man-made channel with elevated banks that flows into the Neches River. The channel is approximately 5–6 feet deep at the intersection with Jefferson Canal and about 20 feet wide with steep side slopes and a silty bottom. Erosion and re-suspension of the canal sediment is considered a secondary source of impact to the environment. The canal is tidally influenced and navigable.[11]

According to the United States Environmental Protection Agency's 2013 Record of Decision ("ROD"), Star Lake Canal and Jefferson Canal was used for the unpermitted discharge of industrial effluents since the 1940s, which has resulted in the deposition of potentially hazardous constituents upon the sedimentary bottoms at the Site. The source of the Site contamination is the historical discharge of chemicals by upstream industries into the Star Lake Canal. Subsequently, the contaminants were transported to other areas and media of the Site by mechanisms including deposition, sediment re-suspension, surface water transport, dredging, and erosion.[12]

Both polycyclic aromatic hydrocarbons ("PAHs") and Total Petroleum Hydrocarbons ("TPH") were detected in samples throughout the Star Lake Canal Superfund Site. For example, the ROD indicates that TPH (C6-CI2), (>CI2-C28), (>C28-C35), and (C6-C35) concentrations were detected in more than one sample: Star Lake Canal surface sediment samples SLC-6, SLC-7, SLC-9, and SLC-11, in mid-depth sediment samples SLC-6 and SLC-11, and in refusal depth sediment samples SLC-4 and SLC-5. TPH (C6-C35) had a maximum

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[8] *Proceedings of the American Petroleum Institute, 1953,* Section III: Refining, "Session on Sludges and Spent Clays," May 11, 1953, p. 360.

[9] Roy F. Weston , "Waste Disposal Problems of the Petroleum Industry," published in Willem Rudolfs, editor, *Industrial Wastes: Their Disposal and Treatment,* Reinhold Publishing Corp., New York, 1953, p. 445.

[10] "How Four Storage Tanks Got a Thorough Cleaning," *Oil & Gas Journal*, June 24, 1957, pp. 126–8.

[11] USEPA, 2013 ROD, p. 12.

[12] USEPA, 2013 ROD, p. 15.

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concentration of 1,700 mg/kg at mid-depth sediment sample SLC-6. PAH constituents were detected in all Star Lake sediment samples at every depth level.[13] Sample locations SLC-9 through SLC-5 are all located downstream of the Shell facility. [See Figure 5] Based on the location of the Shell facility, the flow direction of releases, and tidal influences, any releases from the facility would have impacted the Star Lake Canal, Former Star Lake, Gulf States Utility Canal, Molasses Bayou Waterway and Molasses Bayou Wetland AOIs. Given the long period of operations at the site (circa 1945–1989), there is a high likelihood that a nexus exists between discharges from the tank farm and contaminants that are being addressed at the AOIs identified above and at the Star Lake Canal and Former Star Lake AOIs in particular. Periodic spills, leaks, and other releases would have occurred during routine operations of the tank farm. Tank-cleaning wastes likely would have been generated and disposed at the site and released to Star Lake Canal. Further, the fact that Shell: 1) was assured by deed that it could discharge to the canal as needed, and 2) covenanted that it would use this soil to grade its property so that the land would drain from north to south towards the canal, indicates that Shell intended to discharge effluent from the tank farm to Star Lake Canal. Discharges of petroleum-containing materials would have reached the Star Lake Canal via sheet flow runoff and/or discharges in accordance with Shell's reserved drainage easement. Finally, the ROD indicates that both TPH and PAH constituents are present in Remedial Investigation ("RI") samples for various AOIs located downstream of the Shell facility. According to the ROD, the remedial alternative selected to address contamination present in the Star Lake Canal AOI is 12-inch removal/disposal and containment with a 12-inch clay cap.[14]

[13] USEPA, 2013 ROD, p. 19; Conestoga-Rovers & Associates and Cardno ENTRIX, *Final Tier 2 Remedial Investigation Report*, August 2011, Table 6-2A.

[14] USEPA, 2013 ROD, p. 56.

Figures

Figure 2 – Shell Pipe Line Corporation Site, Approximate Boundary

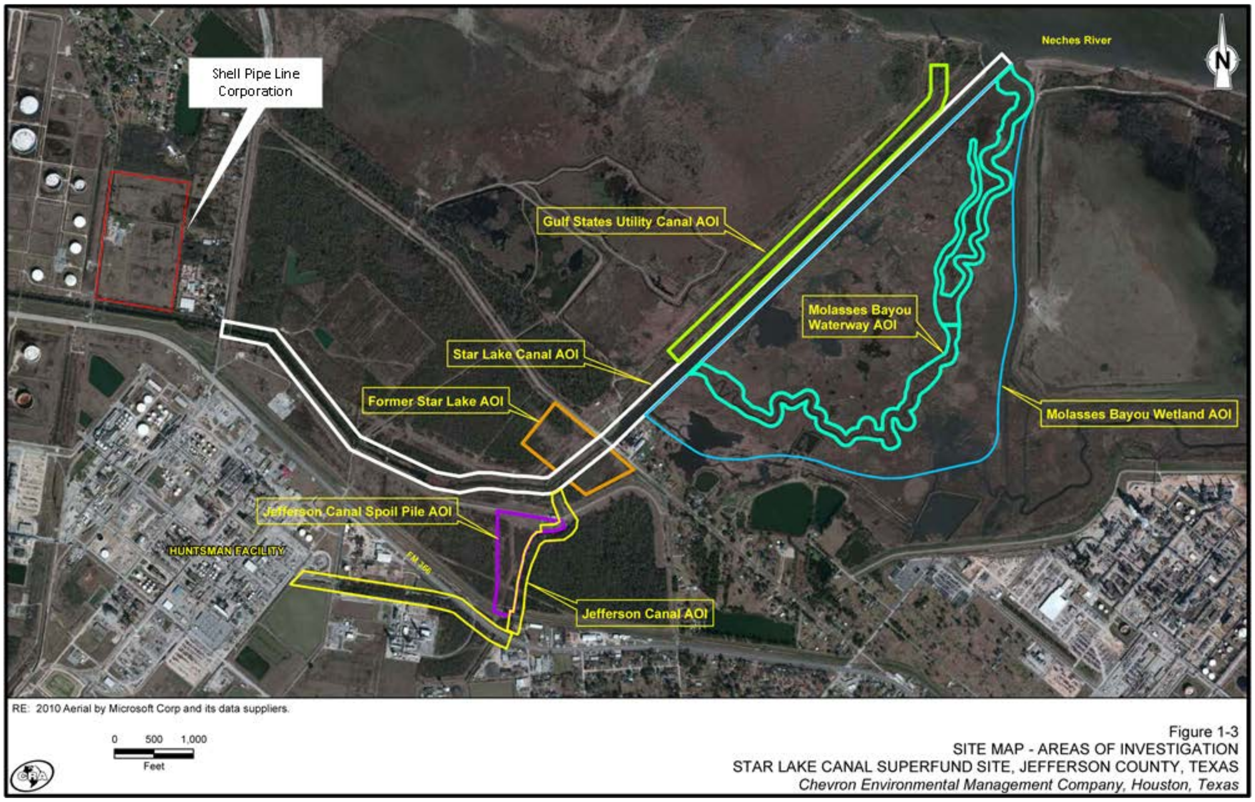

Figure 3 – Land Acquired by the Defense Plant Corporation

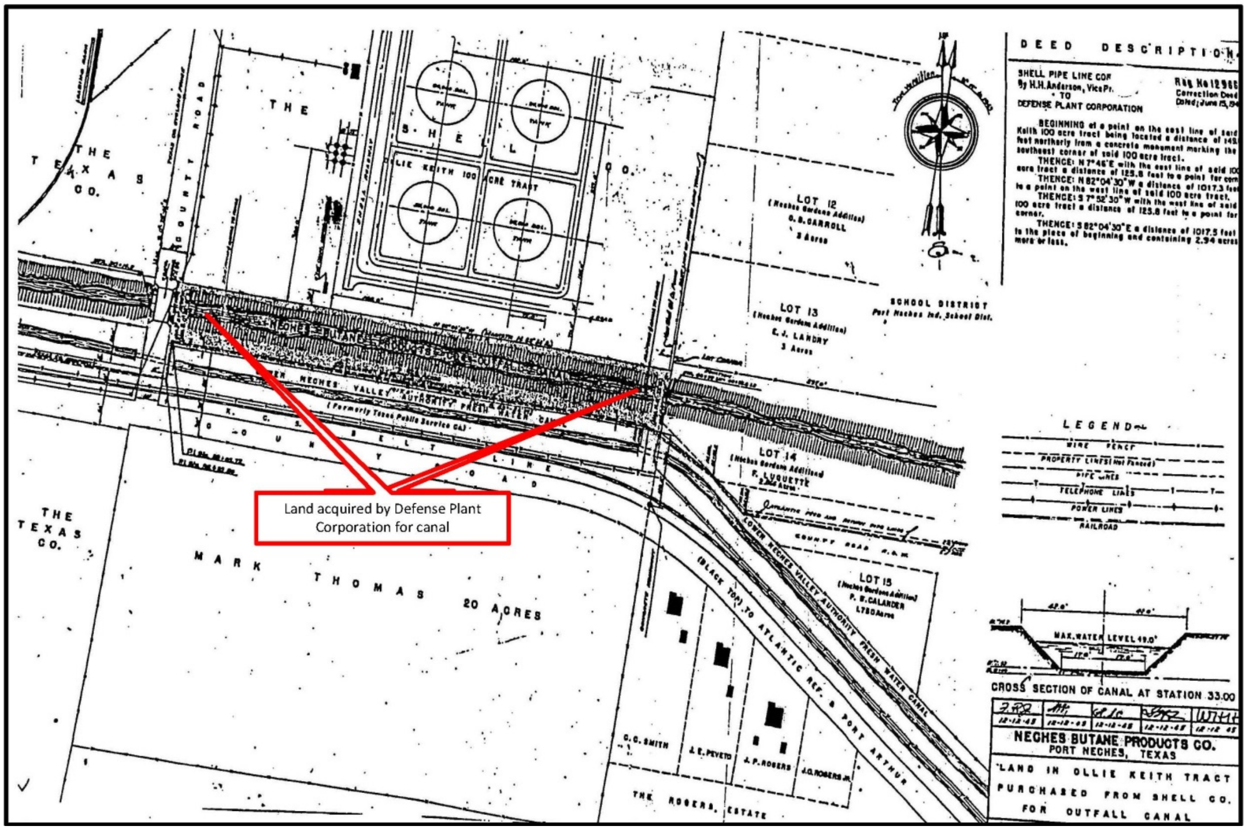

Figure 4 – USGS Aerial Photograph, September 8, 1956

Figure 5 – Shell Pipe Line Corporation, Approximate Boundary